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MANEUVER AND EFFECT:
THE NEED FOR CHUTES AND LADDERS COMMAND AND CONTROL

by

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A paper submitted to the faculty of the Naval War College in partial satisfaction of the requirements of the Department of Joint Military Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

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Abstract

MANEUVER AND EFFECT: THE NEED FOR CHUTES AND LADDERS COMMAND AND CONTROL

Increasingly capable weapons, communications, and information management systems are transforming the manner in which the U.S. conceptualizes its joint forces. This transformation is merging the services' mutual capabilities into two inherently joint combat processes: Maneuver Based Operations (MBO) and Effects Based Operations (EBO). Development of joint command and control (C2) doctrine has proven problematic, however, leaving the responsibility to the individual military services. Consequently, joint component commanders often adopt service-oriented C2 systems and perspectives that conflict with those of assigned or supported forces.

An alternative lies in severing the C2 links between component-based command structures and service-oriented control perspectives and replacing them with process-based command structures and adaptive control perspectives. Three attributes, Process Based Command, Adaptive Control, and Flexible Combat Tasking form a C2 model represented by a series of successive and short vertical information links that are integrated and coordinated with long direct links between upper and lower organizational echelons, or Chutes and Ladders C2. This recommendation facilitates jointness by synthesizing attributes of Full Spectrum Dominance and by severing the links to service oriented structures and perspectives. As such, it retains the time-tested strengths of conceptual and centralized control while reducing conflict by changing the context in which these control options are applied.

MANEUVER AND EFFECT: THE NEED FOR CHUTES AND LADDERS COMMAND AND CONTROL

Increasingly capable weapons, communications, and information management systems are transforming the manner in which the U.S. conceptualizes its joint forces. This transformation is merging the services' mutual capabilities from a joint application of three distinct components (land, air, and sea) to a joint application of two distinct combat processes: Maneuver Based Operations (MBO)¹ and Effects Based Operations (EBO). *Joint Vision 2020* links this transformation to command and control (C2) noting, "In the joint force of the future, command and control will remain the primary integrating and coordinating function for operational capabilities and Service components. As the nature of military operations evolves, there is a need to evaluate continually the nature of command and control organizations, mechanisms, systems, and tools."² Development of joint C2 doctrine has proven problematic, however, leaving the responsibility to the individual military services. Consequently, joint component commanders often adopt service-oriented C2 systems and perspectives that conflict with those of assigned or supported forces.

Ultimately, as the military services achieve joint capabilities C2 debate will be rooted in conflict over who commands joint forces, the level of control they possess, and which forces fall under their control. An alternative lies in severing the C2 links between component-based command structures and service-oriented control perspectives and replacing them with process-based organizational structures and adaptive control perspectives. This paper argues for integrating three attributes: Process Based Command, Adaptive Control, and Flexible Combat Tasking. Together these attributes form a C2 model in which tactical elements are

flexibly tasked to either MBO or EBO-based command structures with adaptive control perspectives. Conceptually, this model would appear as a series of successive and short vertical information links integrated and coordinated with long direct information links between upper and lower organizational echelons or, Chutes and Ladders C2. As *Joint Vision 2020* recommends, the proposed Chutes and Ladders model is focused on integrating and coordinating operational capabilities and Service components.³ Therefore it is intimately shaped by the following service-oriented C2 perspectives.

The basic terms used to describe C2 systems are generally agreed upon, although individual service perspectives and many of the subsequent details are not. JP 6-0, *Doctrine for Command, Control Communications, and Computer Systems Support*, defines command and control as, “The exercise of authority and direction by a properly designated commander over assigned and attached forces in the accomplishment of the mission.”⁴ Additionally, it states C2 systems must, “... make available the information that is important; provide it where needed; and ensure that it gets there in the right form and in time to be used.”⁵ However, the ramifications of choosing a “properly designated commander” and the situationally-dependant meanings of terms such as “important”, “where needed” and “in time” provide for radically different perspectives on the proper structure of C2 models.

Additionally, most theoretical C2 models are oriented toward one of two extremes: hierarchical or networked. Hierarchical models apply centralized control with predominantly vertical information flows while networked models incorporate decentralized control with predominantly horizontal information flows. The military services have adopted different C2 perspectives based primarily on their mission-oriented need to maintain centralized or decentralized control. As Keithly and Ferris point out, “... the conspicuous challenges of the

modern battlefield [are] the pressures for technologically induced centralization of execution on the one hand, and the decentralizing imperatives of operations on the other hand.”⁶

The Air Force has traditionally favored a centralized C2 model. In fact, Air Force doctrine claims, “Vertical information flow is fundamental to centralized control … without this flow, commanders cannot give meaningful feedback when controlling operations.”⁷ The combat processes that support the Air Force’s strategic attack mission, such as intelligence, surveillance, recognition, (ISR), targeting, and assessment, are all highly dependent on advanced information management capabilities. Information Superiority is listed as one of the Air Force’s core competencies and contributes to its vision for future operations.⁸ Consequently, the Air Force tends to welcome advances in information capabilities regardless of their impact on centralized control. For example, according to Air Force doctrine, information is a key enabler for operational-level decision making. “The aerospace operations centers are becoming more capable of gathering and fusing the full range of information, from national to tactical, in real-time, and rapidly converting that knowledge and understanding-to assure decision dominance over U.S. adversaries. This brings into focus the driving issues that affect U.S. Air Force command and control.”⁹

The Air Force also states, “Focusing an entire theater’s aerospace power in a central planning process maximizes the overall effect on the enemy, given a finite amount of aerospace power assets. The process of developing the joint air operations plan (JAOP), and executing it through an air tasking order (ATO), represents the operational art of aerospace warfare.”¹⁰ Interestingly, the Air Force’s perception of centralized control as critical to its operational art is in direct contrast to the philosophy that has evolved within the land and naval component services.

Unlike the Air Force perspective, the Army, Navy, and Marine Corps favor a decentralized C2 model in which decision making is pushed down the organizational chain to the lowest possible tactical elements. According to this philosophy, flexibility and initiative are critical to success in dynamic combat situations. For example, Army doctrine argues for a decentralized command structure because, “Subordinates can view the overall situation and exercise initiative to achieve the commander’s intent without waiting for higher headquarters to provide direction.”¹¹ Additionally, Navy doctrine states, “Initiative is crucial to the success of a maneuver warfare strategy, which is characterized by the high operational tempo generated when commanders at the lowest level are free to recognize and exploit enemy vulnerabilities as they present themselves during combat ...”¹² Thomas Coakley expresses the underlying purpose of this perspective when he writes, “Our philosophy of command and control is disciplined by the underlying principle that decisions are made at the lowest possible level so that flexibility is given along with the resources, authority and responsibility to those who can use them to best advantage – the commanders on the scene.”¹³

In contrast to the optimism expressed by the Air Force, information management advances are viewed with caution by the other services. Specifically, many C2 theorists argue that increased information capabilities will lead to a subsequent, almost irresistible, trend towards increased centralized control. Sullivan and Dubik note “... increasingly capable integrative technology may, once again, generate the false belief that centralized decision making will result in greater combat effectiveness at the point of battle.”¹⁴ In a similar manner, Gregory Roman observes, “The seductiveness of information technology stimulates military organizational orientation towards centralized control and more rigid hierarchical organizations ...”¹⁵ Naval doctrine also recognizes this concern. “In many

ways, technology has helped U.S. forces keep pace with the increasing complexity of war. Nevertheless, technology is not without its dangers. We must always strike a balance between over relying on technology on one hand and failing to make proper use of technology on the other.”¹⁶

The distinctly different service perspectives have led to conflict over joint C2 issues. Not surprisingly, most theorists tend to favor a decentralized C2 model during joint military operations. For example, Gregory Roman argues that the Air Force’s ATO process has become a maladaptive legacy of an earlier era. “The JFACC and ATO concepts are a product of hierarchical organizations and centralized control, perhaps the last vestiges of excessive concern over independence. While effective in industrial-age warfare, the limitation centralized control places on timeliness, flexibility, and tempo create potentially serious problems should the U.S. military face an adversary operating at a faster operations tempo.”¹⁷ Keithly and Ferris extend the argument by claiming the Army’s orientation toward decentralized decision making should be reflected in all service and joint doctrine. “The U.S. Army has made considerable progress toward the integration of directive [decentralized] control in its training and education programs. Now the other services should accord the concept similar attention. It should be endowed with more substantial philosophical underpinning, reflected in both service and joint doctrine.”¹⁸

Interestingly, many air power-oriented C2 theorists have made similar arguments against the Air Force’s commitment to centralized control during joint military operations. Thomas Coakley argues there may be a single best solution to the tension between centralized and decentralized control when he advocates for a middle ground or compromise C2 model. “Might we be using the phrase ‘centralized control, decentralized execution’ to avoid

deciding how to find the appropriate mean between centralized and decentralized C2?”¹⁹

Finally, Stephan McNamara argues that a possible solution is for the JFACC to retain centralized control of joint air assets, but to limit the JFACC’s span of control to the theater air battle to avoid conflict with land component combat processes. “If the Air Force really wants the JFACC to be a theater air commander, then it should release the JFACC from daily tactical control over all fixed-wing aircraft operations and concentrate instead on the theater air battle fought by all air and space assets … it is probably time to take a step backward so air power can take two steps forward.”²⁰

Lambert points out that the service-oriented conflict over joint C2 is based on sincere concerns over the combat effectiveness of joint forces rather than service parochialism when he speaks of, “ … honest disagreement among professionals who find themselves viewing the world through different perceptual filters … the soldier on the ground may intellectually comprehend the benefits to be derived from the independent application of air power, but he also has a very real desire for its effects to be used to his immediate milieu of land warfare.”²¹ However motivated and well-intentioned, conflicting service C2 perspectives have led to persistent doctrinal challenges in joint fire situations. For example, debate over the development of Joint Publication 3-09 *Doctrine for Joint Fire Support* proved contentious and ultimately caused the coordination process to extend for several years. As Robert D’Amico notes, “The complexity of this difficulty can be seen in the controversy associated with Joint Pub 3-09, which was in coordination between 1994 and 1998 … the lengthy coordination is indicative of the joint fires controversy and illustrates the complexity of the problem of joint fires and the conflict among the services.”²² Ultimately, Thomas Coakley best summarizes the conflict over a joint C2 model when he observes the cultural

and inherently contextual nature of the debate. “In the final analysis, the line between command and control is blurry but established by usage. It is significant to some people, unimportant to others. Similarly, control means one thing to some people, other things to others. Clues to its meaning in a particular usage have to be derived from the context.”²³

Perhaps it should come as no surprise that the debate over joint C2 has evolved concurrently with the mutual transformation of the military services’ capabilities. Benjamin Lambert argues that technological advances in the military services’ weapons have lead to a mutual merging of capabilities, and in turn, to concern over the viability of traditional service roles and missions. “Ironically, technology has occasioned a coalescence of the most basic Air Force and Army functions, although neither service has been inclined to portray things that way, for understandable reasons.”²⁴ Retired Army General Glenn Otis extends the argument by claiming that the convergence in capabilities, and subsequently in the services’ respective roles and missions, calls into question many terms currently used to conceptualize the joint battlespace. “... There is no longer any concept of a Forward Line of Troops (FLOT) from which to visualize close or deep fires. Instead, long range artillery, longer range missiles (ATACMS), long-range helicopter attacks, and long-range fixed air will attack enemy enclaves throughout the battlespace.”²⁵ Additionally, D’Amico makes a similar argument as an explanation for the unusually long debate and coordination process over Joint Pub 3-09 when he remarks, “Every service has weapon systems that transverse intra-theater boundaries. They can attack close and deep targets; thus command, control, and coordination become critical operational design requirements.”²⁶

The conflict over joint C2 models, ultimately, points to a fundamental dilemma of jointness. Obscured in much of the joint C2 debate is the recognition that once distinct

service roles and missions are now merging. Subsequently the conceptualization of forces that used to fall along the relatively clear lines of land, sea, and air is becoming increasingly arbitrary. The joint force is currently organized under joint force component commanders, but as the Joint Pub 3-09 coordination process demonstrated, it is increasingly difficult to identify a specific component commander to control inherently joint combat processes and battlespace. Additionally, when a component commander is chosen, their service-oriented C2 systems and perspectives will often conflict with those of their assigned forces. Ultimately, debate over C2 models is rooted in conflict over who will command joint forces, what level of control they will possess, and which forces will fall under their control. Army Col Douglas MacGregor speaks to this dilemma when he argues against a proposal to assign responsibility for the deep battlespace to one component commander - in this case the JFACC. “Control of the air in contemporary concepts of future warfare has become synonymous with centralization of control over all land-based and sea-based deep-strike assets in the hands of the JFACC.”²⁷ However, where Col MacGregor argues against the choice of a specific component commander, perhaps a better argument would be against a component-based joint C2 structure at all. This raises the following question. If component-based command structures and service-based control perspectives lead to conflict, how should joint forces be organized, controlled, and tasked instead?

As an alternative to organizing joint forces by component, C2 doctrine should be linked to the operational requirements of emerging joint combat processes. Developing these links requires the recognition and synthesis of three attributes: Process Based Command, Adaptive Control, and Flexible Combat Tasking. The first attribute addresses joint organizational structures. The current component-based command structure should be replaced with

command structures developed to support two emerging joint combat processes: Effects Based Operations (EBO) and Maneuver Based Operations (MBO). The second attribute addresses the control of joint forces. This attribute is based on the premise that all C2 relationships, or vertical information flows, begin conceptually and end with specific weapons targeting decisions. However, the organizational level at which conceptual information transitions into specific targeting decisions varies greatly depending on the purpose of the joint combat process involved. This distinction determines the appropriateness of centralized planning and control and provides a key distinguishing characteristic between EBO and MBO combat processes. The third attribute addresses the emerging flexibility of modern weapons and their subsequent tasking. Many weapon systems, whether employed from the land, sea, or air, are capable of supporting EBO or MBO processes. To accommodate flexible tasking, however, tactical elements will need the ability to plug into process-based command structures and adopt appropriate control perspectives. When combined, these three attributes form the Chutes and Ladders C2 model that is explained in the following sections.

The first attribute, Process Based Command, argues that command relationships should be linked to emerging joint combat processes rather than military components. This argument reflects two complementary trends. First, emerging weapons capabilities are shifting the conceptualization of modern warfare from a joint application of three distinct components (land, air, and sea) to a joint application of two distinct combat processes (EBO and MBO). Second, weapons improvements are enabling land, sea, and air forces to make effective contributions to either process in a truly joint manner.

The first combat process, Maneuver Based Operations, relies on real-time battlespace awareness, surprise, mobility, exploitation of fleeting battlefield opportunities, and individual initiative. Martin van Creveld describes the essence of maneuver warfare as, “... exploiting the terrain, maintaining cover, and jockeying for position, all the while waiting for the opportune moment to arrive.”²⁸ For its part, the Air Force has historically experienced challenges supporting MBO because they required the identification, targeting, and engagement of objects that were small, unpredictable, maneuverable, and easily hidden. As U.S. Navy Capt Lyle G. Bien noted, “The 48-hour ATO cycle does not permit rapid response to mobile targets.”²⁹ The Air Force has responded to this challenge by dedicating aircraft within the ATO to specific patrols or “kill boxes” to ensure firepower was available at the right place and time. Often, though, these tactics resulted in issues over efficiency because they required dedicated resources that could have arguably been employed elsewhere.

The Air Force’s current pursuit of persistence, however, will enhance its ability to employ weapons in dynamic situations against time-sensitive or perishable targets. The Air Force defines persistence as the ability to loiter in a given area and provide nearly instantaneous weapons capabilities when needed. This capability is very useful against the small and mobile targets that have remained elusive despite advances in precision.

According to Maj. Gen. Robert Chedister, “The Air Force is devising a new concept of operations (CONOPS) for lethal unmanned aerial vehicles (UAVs) in which they would be released into a theater and loiter until they are tasked by a larger network.”³⁰ Additionally, according to Air Force Chief of Staff, Gen. John Jumper, “Our view is that the main benefit of what we’ve found in unmanned vehicles is, very simply, their endurance and their persistence.”³¹

Technological advances in weapons and information capabilities have also transformed the Army's ability to dominate the battlespace and support MBO. Sullivan and Dubik describe dominant maneuver operations in which, "... trends verify that smaller or fewer units will be able to produce decisive effects because of the vast array of weaponry they have at their disposal and the speed with which they will be able to acquire targets, maneuver, employ fires, and relocate."³² Additionally, the Navy and Marines describe a future combined arms expeditionary force concept called Ship-to-Objective Maneuver (STOM) in which a "... combination of lightweight, lethal, and expeditionary fire support capabilities will increasingly exploit digital connectivity, allowing commanders to rapidly integrate responsive fires with decisive maneuver and develop overwhelming combat power."³³

The second process, Effects Based Operations is defined as "A process for obtaining a desired strategic outcome or 'effect' on the enemy, through the synergistic, multiplicative, and cumulative application of the full range of military and nonmilitary capabilities at the tactical, operational, and strategic levels."³⁴ Technological advances in precision weapons have enabled the Air Force's transformation from its tradition of strategic bombing to the current concept of EBO. As Lambert notes, "In generations past, the U.S. Air Force and other developed air arms around the world pursued such strategies [strategic bombing] because they were the only employment options that extant "strategic" weapons, at least nonnuclear ones, could underwrite with any hope of achieving the desired physical results."³⁵ However, new precision capabilities now allow the Air Force to decisively shape the deep battlespace. William Hawkins agrees, saying, "... the role of air power will need to be shifted from Douhet-style 'strategic' attacks against social and economic targets to more tailored strikes against regime and military targets in support of Army operations."³⁶

Ultimately, Lambert argues the meaning of strategic attack has been transformed by precision. Where strategic once meant an indirect attack against the will of an adversary's leadership or people, it now means the accomplishment of direct and decisive operational effects. "... Strategic air attack cannot be routinely expected to break an enemy leadership's will or bring down a political regime ... however, those need no longer be the goals of air power's employment when 'strategic attack' can now strike directly at an enemy's instruments of power and, in effect, deny him the ability to do anything of operational consequence, irrespective of his will."³⁷

Advances in information capabilities, precision, and range have also transformed the Army's ability to achieve operational effects. "... longer range precision weapons systems like Apache, LANCE, ATACMS, and MLRS ... all confirm the trend toward increased precision accompanying increased volume."³⁸ Additionally, Sullivan and Dubik argue that, "... direct fire will be redefined in the information age. Armies will be able to shoot or move directly against enemy forces or specific targets even though they may be tens of thousands of kilometers away."³⁹ Likewise, precision, range, and volume of fires have transformed the Navy's ability to achieve operational effects over land. "The rapidly increasing volume of precision-weapon firepower available from the new generations of sea-based strike aircraft as well as high-volume missile-firing ships and submarines and precision-gunfire ships will increasingly enable forward-deployed naval forces to have a decisive impact."⁴⁰

A fundamental characteristic of EBO combat is targeting specificity. Achieving deliberate strategic or operational effects necessarily requires prior analysis and the targeting of specific objects with precision weapons. It is this deliberate, carefully orchestrated dynamic that fundamentally distinguishes EBO from the unpredictable and rapid tempo of

MBO. Consequently, EBO combat prospers under centralized control while MBO combat prospers under decentralized control. This leads to Adaptive Control, the second attribute of Chutes and Ladders C2.

Adaptive Control argues that all C2 relationships, whether EBO or MBO based, emanate from a joint force commander's (JFC) operational concept. The commander's concept becomes the basis for decentralized decision making as conceptual information is passed down the organizational structure. The idea of conceptual control has a rich history, although it has been called many names. For example, during WWII, German doctrine referred to Auftragstaktik, or directive control. According to Keithly and Ferris, "Auftragstaktik subsumes all the following concepts: individual initiative, independent decision making, and thinking leaders reaching tactical decisions on their own accord."⁴¹ Air Force Colonel John Boyd came to a similar conclusion, referring to the concept as Organic Control in which he stressed the importance of organizational trust and harmony. Boyd emphasized the commander's proper role was one of monitoring rather than controlling, saying, "... leadership with monitoring, rather than command and control, seems a better way to cope with the multi-faceted aspects of uncertainty, change, and stress."⁴²

Builder, Banks, and Nordic coined the term "conceptual control" defining it as, "... a vision of a prospective military operation that informs the making of command decisions during that operation."⁴³ They further argue that conceptual control is best applied throughout all organizational echelons, claiming, "... command concepts should apply to all levels of command – from theater commanders to squad leaders, each of whom will have his own command concept that forms the basis for his decisions. Each of those concepts should be hierarchically nested and consistent. That is, the squad leader understands his platoon

leaders' concept for platoon operations and has then developed his own for squad operations, which is supportive of the concept for the next higher level and consistent with it.”⁴⁴

However, an important distinction must be made at this point. Where many C2 theorists, like Builder, have argued conceptual control should always extend to the lowest organizational levels, in a Chutes and Ladders model, conceptual control is only passed down to the point where the concept transitions into specific weapons employment decisions. During unpredictable and dynamic MBO, specific targeting decisions must be decentralized and delegated to the lowest organizational echelons. Using the Chutes and Ladders analogy this would be represented by successive levels of short conceptual links extending from the top to the bottom of the organization. During EBO, on the other hand, the need to orchestrate operational effects requires the centralized transition of conceptual information into specific operational level targeting decisions. Using the Chutes and Ladders analogy, this would be represented by longer direct control linkages between operational and tactical elements. Finally, EBO and MBO C2 structures and perspectives should exist concurrently while flexibly incorporating any tasked combat elements as discussed in the next section.

The third attribute of Chutes and Ladders C2, Flexible Combat Tasking, argues that individual tactical elements will need to be trained and equipped to support either MBO or EBO interchangeably. As weapons achieve greater capabilities, they also become more flexible and joint in nature. As D’Amico points out, “... the Army has ATACMS and Apache helicopters; the Marine Corps has F/A-18s, AV-8s, and LAMB aircraft; Special Operations Forces have direct action and special reconnaissance teams; and both the Navy and Air Force have strike aircraft, cruise missiles, and unmanned aerial vehicles.”⁴⁵ Consequently, as the Quadrennial Defense Review Report (QDR) reported, “Such joint and

combined interoperability requires forces that can immediately ‘plug’ into the joint battlefield operating systems (command and control, intelligence, fire support, logistics, etc.)”⁴⁶

According to *Joint Vision 2020*, “Our thinking about command and control must be conceptually based, rather than focused on technology or material.”⁴⁷ Accordingly, Chutes and Ladders C2 is a conceptual model for future joint doctrine. As such, it has its strengths and weaknesses. A strength of the Chutes and Ladders model is that it reframes the C2 debate. Although many C2 advocates have argued for a common joint C2 perspective, these arguments are often based on unique service-oriented perspectives. This led the Joint C2 Doctrine Study to conclude a common joint C2 perspective was unattainable. “The development of a separate joint publication on C2 has failed before and will require more time and effort than modification of an existing joint publication(s). One publication will not be comprehensive enough to address all aspects of C2 in every situation.”⁴⁸

However, by reframing the separate problems of joint command structures, joint force control, and flexible combat tasking, a Chutes and Ladders C2 model avoids service-oriented conflict. For example, consider the following critique on the Air Force’s centrally planned and controlled ATO. “... [The Air Force’s] institutional orientation continues to be that the ATO must be centralized at the top. Thus, the only improvements sought will be in shortening the ATO cycle, rather than looking for alternatives. In any case, there appears to be little interest in the Air Force joining the other services in advocating a new command and control orientation. The high operations tempo of future wars demands the Air Force to take a fresh orientation perspective.”⁴⁹ Under a Chutes and Ladders C2 model this critique represents a mismatch between the ATO, a centrally planned and controlled C2 structure and

the MBO-oriented combat activities the ATO was tasked to support. The solution isn't to indiscriminately decentralize all air operations as is often argued. To do so would negatively impact EBO processes. Instead, the solution is to organize a dedicated MBO command structure by apportioning and tasking an integrated land, air, and sea force with a similar dynamic battlespace orientation. As Martin van Creveld notes, "Maneuver requires generalizing this approach to overall air operations so as to affect events on the ground in a timely manner. Many opportunities are fleeting. When tempo is critical for the ground element, so too must it be for the air portion interacting with ground forces."⁵⁰

Similarly, the Chutes and Ladders C2 model reveals a flaw in Col MacGregor's concern with deep battlespace assets falling under the centralized control of the JFACC. The solution is not to debate which component commander owns the deep battlespace. Range and precision have obscured the distinction between deep and close battlespace. Instead, the solution is to identify a joint EBO commander to conceive and orchestrate strategic and operational effects through centralized planning and control of all EBO targeting decisions whether the tasked combat elements are based on land, sea, or air.

The Chutes and Ladders C2 model also has weaknesses. By focusing on the organization and control of joint forces, it ignores the technical complexities of developing real world information systems. It also fails to address the role of organizational culture and the difficulties involved in changing current service perspectives. As the QDR notes, a joint C2 structure, "... must develop and foster a joint professional culture, a requirement that presents a significant challenge to service and joint training and professional education programs."⁵¹ By emphasizing vertical information flows, the model overlooks the impact of advancements in horizontal information flows. Horizontal information concepts such as net

centric warfare augment the Chutes and Ladders C2 concept by enhancing the battlespace awareness of tactical elements, regardless of their specific C2 arrangements. As Air Force doctrine points out, “Both vertical and horizontal information flows exchange data that, when fused in a timely manner, becomes integrated information to provide the framework for taking the best possible decision—enabling decision dominance.”⁵² Finally, the model doesn’t address the challenges posed by coordinating EBO and MBO processes to ensure the JFC’s unity of purpose or as Col Boyd called it, “operational harmony”.⁵³ Likewise, it ignores the challenge of deconflicting EBO and MBO combat processes that simultaneously occur within the same joint battlespace.

Ultimately, though, a Chutes and Ladders C2 facilitates jointness. It does so by incorporating key attributes of *Joint Vision 2020*’s Full Spectrum Dominance (Information Superiority, Precision Engagement, and Dominant Maneuver).⁵⁴ Additionally, it contributes to jointness by severing the links to component-based command structures and service-oriented control perspectives and reorganizing forces by joint combat process, matching the level of control to the combat process, and ensuring the flexibility needed for weapon systems to seamlessly contribute to either or both processes when tasked. As such, it possesses the advantages of conceptual and centralized control but reduces conflict by first isolating, and then integrating and coordinating, the processes in which they are applied. As the naval theorist Alfred Mahan observed, “While many of the conditions of war vary from age to age with the progress of weapons, there are certain teachings in the school of history that remain constant. It is wise to observe things that are alike; it is also wise to look for things that differ.”⁵⁵

ACRONYMS

ATACMS	Army Tactical Missile System
ATO	Air Tasking Order
CONOPS	Concept of Operations
C2	Command and Control
EBO	Effects Based Operations
FLOT	Forward Line of Own Troops
ISR	Intelligence Surveillance and Recognizance
JOAP	Joint Air Operations Plan
JFACC	Joint Force Air Component Commander
JFLCC	Joint Force Land Component Commander
JFMCC	Joint Force Maritime Component Commander
MBO	Maneuver Based Operations
MLRS	Multiple Rocket Launcher System
QDR	Quadrennial Defense Review
UAV	Unmanned Aerial Vehicle
STOM	Ship To Object Maneuver
USA	United States Army
USAF	United States Air Force
USN	United States Navy
USMC	United States Marine Corps

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NOTES

¹ Although the acronym for Effects Based Operations (EBO) is common, the equivalent acronym for Maneuver Based Operations (MBO) is not. Most sources refer to “Maneuver Warfare” or “Maneuver Dominance” with an emphasis on the land component. I’ve used MBO to ensure simplicity and consistency between the two combat processes and to stress the emerging “jointness” of both.

² Joint Chiefs of Staff, Joint Vision 2020 (Washington DC: 1 Jun 2000) 31-32.

³ Ibid. 31-32.

⁴ Joint Chiefs of Staff, Joint Doctrine for Command, Control, Communications, and Computer (C4) Systems Support to Joint Operations, Joint Pub 6-0 (Washington, DC: 30 May 1995), GL-4.

⁵ Ibid. I-1.

⁶ David M. Keithly and Stephan P. Ferris, “Auftragstaktik or Directive Control in Joint and Combined Operations,” Parameters (Autumn 1999): 7.

⁷ Headquarters, Department of the Air Force, Command and Control, Air Force Doctrine Document 2-8 (Washington DC: 16 Feb 2001), 6.

⁸ Headquarters, Department of the Air Force, Air Force Basic Doctrine, Air Force Doctrine Document 1 (Washington DC: 1 September 1997), 31.

⁹ Air Force Doctrine Document 2-8, 10.

¹⁰ Headquarters, Department of the Air Force, Organization and Employment of Aerospace Power, Air Force Doctrine Document 2 (Washington DC: 17 Feb 2000), 4.

¹¹ Headquarters, Department of the Army, Operations, Field Manual 3-0 (Washington DC: 14 Jun 2001), 7-28.

¹² Headquarters, Department of the Navy, Naval Command and Control, Naval Doctrine Publication 6 (Washington DC: 19 May 1995), Conclusion.

¹³ Thomas P. Coakley, Command and Control for War and Peace (Washington DC: National Defense University Press 1992), 52.

¹⁴ General Gordon R. Sullivan and Lieutenant Colonel James M. Dubik, Land Warfare in the 21st Century (Carlisle Barracks, PA: Strategic Studies Institute 1993), 18.

¹⁵ Gregory A. Roman, The Command or Control Dilemma-When Technology and Organizational Orientation Collide (Maxwell AFB, AL: Air University Press 1997), 3.

¹⁶ Naval Doctrine Publication 6, Conclusion.

¹⁷ Roman, 27.

¹⁸ Keithly and Ferris, 10.

¹⁹ Coakley, 171.

²⁰ Lieutenant Colonel Stephan J. McNamara, Air Power's Gordian Knot-Centralized Versus Organic Control (Maxwell AFB, AL: Air University Press 1994), 154.

²¹ Benjamin S. Lambeth, The Transformation of American Air Power, (Ithaca and London: Cornell University Press 2000), 285.

²² Robert J. D'Amico, "Joint Fires Coordination: Service Competencies and Boundary Challenges," Joint Force Quarterly, (Spring 1999) 74.

²³ Coakley, 40.

²⁴ Lambert, 314.

²⁵ Lambert 279.

²⁶ D'Amico, 71.

²⁷ Lambert, 293.

²⁸ Martin van Creveld with Steven L. Canby and Kenneth S. Brower, Air Power and Maneuver Warfare (Maxwell AFB, AL: Air University Press 1994) 2.

²⁹ Roman, 24.

³⁰ "Air Force Developing New CONOPS For Loitering Lethal UAVs," Aerospace Daily, 17 Dec 2002, <<http://ebird.dtic.mil/Dec2002/s20021217126870.html>> [17 Dec 02].

³¹ "Air Chief Seeks Armed Drone With More Endurance Than UCAV Offers" Inside the Pentagon, 5 Dec 2002, <<http://ebird.dtic.mil/Dec2002/s20021205140236.html>> [5 Dec 02].

³² Sullivan and Dubik, 22.

³³ Headquarters, Department of the Navy, "Naval Transformation Roadmap: Power and Access ... From the Sea", (Washington DC: non-dated) 16.

³⁴ "Joint Forces Command Glossary", United States Joint Forces Command, <<http://www.jfcom.mil/about/glossary.htm>> [26 Jan 03].

³⁵ Lambert, 269.

³⁶ William R. Hawkins, “Imposing Peace: Total vs. Limited Wars, and the Need to Put Boots on the Ground,” Parameters (Summer 2000): 8.

³⁷ Lambert, 301.

³⁸ Sullivan and Dubik, 15.

³⁹ General Gordon R. Sullivan and Lieutenant Colonel James M. Dubik, War in the Information Age (Carlisle Barracks, PA: Strategic Studies Institute 1994), 14.

⁴⁰ Naval Transformation Roadmap: Power and access ... From the Sea, 11.

⁴¹ Keithly and Ferris, 1.

⁴² John R. Boyd, “Organic Design for Command and Control,” and excerpt from A Discourse on Wining and Losing, a selection of unpublished notes and visual aids compiled from 1976 to 1992, 32.

⁴³ Carl H. Builder, Steven C. Banks, and Richard Nordin, Command Concepts-A Theory Derived from the Practice of Command and Control, (Santa Monica: RAND 1999) xiv.

⁴⁴ Ibid. xvi.

⁴⁵ D’Amico, 71.

⁴⁶ Department of Defense, Quadrennial Defense Review Report (Washington DC: 30 September 2001), 33.

⁴⁷ Joint Vision 2020, 40.

⁴⁸ Joint Chiefs of Staff, Joint C2 Doctrine Study (Washington, DC: 1 Feb 99), EX-21.

⁴⁹ Roman 26.

⁵⁰ Crevald, 204.

⁵¹ Quadrennial Defense Review Report, 33.

⁵² Air Force Doctrine Document 2-8, 6.

⁵³ As Boyd develops his organic control argument, he discusses the importance of four attributes: Harmony and Initiative which lesson internal friction and Variety and Rapidity which increase an adversary’s internal friction. See Organic Design for Command and Control, 4.

⁵⁴ Joint Vision 2020, 2.

⁵⁵ Sullivan and Dubik, Land Warfare in the 21st Century, 1.